I CLAIM:

1. A system for accelerating the solution of treatment gas into a liquid stream, said system being adapted to receive and maintain said stream under pressure, said system comprising:

an aspirating injector comprising a body having an axial passage, a converging section, a throat section and a diverging section in said passage in that order, an injector port through said body entering said throat section and adapted to receive treatment gas to be dissolved in said liquid stream, said passage having an inlet port to receive said stream, and an outlet port;

a collider and a reactor, each having an inlet port and an outlet port, the inlet port of one of them being connected to the outlet port of the injector, its outlet port connected to the inlet port of the other and; a fluid release receiving said stream from said last mentioned outlet port for releasing the treated stream from the system while maintaining the system under pressure.

2. A system according to claim 1 in which said fluid release comprises a gas/liquid separator which separates and releases the stream's liquid and the stream's gases which remain undissolved in said liquid.

3. A system according to claim 2 in which said fluid release further includes a regulator valve for the liquid stream.

4. A system according to claim 2 in which said separator is a centrifugal separator.

5. A system according to claim 1 in which said collider comprises a body forming a chamber, pair of nozzles opposing one another, said stream being divided so a portion flows through each said nozzle with their streams flowing toward and meeting one another in said chamber, said body having an outlet port exiting the chamber.

6. A system according to claim 5 in which said portions of said stream intersect at an included angle not larger than 90 degrees.

7. A system according to claim 5 in which said portions of said stream are axially aligned, and in which said exit port exits the chamber laterally, midway between said nozzles.

8. A system according to claim 5 in which each of said nozzles includes a converging section, and twisting vanes in said converging section whereby to impart a rotary motion to the outer

region of the stream as it flows through the nozzle.

9. Apparatus according to claim 1 in which said reactor comprises a body having a central axis with an internal cylindrical wall forming an axial internal cylinder, its said inlet port adapted to receive said stream, and its said outlet port adapted to discharge said stream with an increased dissolved amount of said treatment gas therein, said inlet port and said outlet port being centrally located on said central axis;

a nozzle in said inlet port directing said stream axially into said cylinder;

a partial barrier extending laterally across said cylinder dividing said cylinder onto a first chamber and a second chamber, said barrier having an upstream face facing into said first chamber and axially facing said nozzle, and a downstream face facing into said second chamber and facing said outlet port;

said upstream face having a concave circular first reflecting surface centered on said central axis and facing said nozzle, the radius of said reflecting surface being smaller than the internal radius of said internal cylindrical wall;

a plurality of axially extending arcuate blades, each having an outer wall closely fitting to said internal cylindrical wall, a dimension of radial thickness, and an inner wall concentric with its said outer wall, said blades having axially-

extending side walls, said blades being angularly spaced from one another to provide an equal number of axial slots between them;

a cove surface circularly surrounding said first nozzle, extending to said inner walls of the blades and to their intersections with said slots, whereby said stream discharges from said nozzle so a major portion of it strikes said reflecting surface, which reverses a major portion of the flow to the cove surface which in turn reflects a major portion of said flow toward said barrier along said blades and in said slots, said partial barrier being pierced between with slots between said slots to provide for flow from said first chamber into said second chamber, thereby to pass said flow from the first chamber into said second chamber, said outlet port discharging from said second chamber.

10. Apparatus according to claim 9 in which said second chamber comprises a partial barrier facing toward said outlet port, a plurality of blades and slots as in said first chamber, said slots in the first and second chamber being rotationally displaced from one another, whereby to form joggle shoulders encountered by portions of the stream flowing across the barriers, said second chamber including a cove receptive of some of the flow across the barrier to reflect at least some of the flow of the stream to the barrier in said second chamber, which

in turn reflects it to said outlet port.

11. Apparatus according to claim 10 in which said fluid release comprises a gas/liquid separator which separate and releases the stream's liquid and the stream's gases which remain undissolved in said liquid.

12. Apparatus according to claim 3 in which said fluid release comprises a gas/liquid separator which separate and releases the stream's liquid and the stream's gases which remain undissolved in said liquid.

13. Apparatus according to claim 11 in which said separator is a centrifugal separator.

14. Apparatus according to claim 10 in which said collider comprises a body forming a chamber, pair of nozzles opposing one another, said stream being divided so a portion flows through each said nozzle with their streams flowing toward and meeting one another in said chamber, said body having an outlet port exiting the chamber.

15. Apparatus according to claim 14 in which said portions of said stream intersect at an included angle not larger than 90

degrees.

16. Apparatus according to claim 14 in which said portions of said stream are axially aligned, and in which said exit port exits the chamber laterally, midway between said nozzles.

17. A system for accelerating the solution of treatment gas into a liquid stream, said system being adapted to receive and maintain said stream under pressure, said system comprising:

an aspirating injector comprising a body having an axial passage, a converging section, a throat section and a diverging section in said passage in that order, an injector port through said body entering said throat section and adapted to receive treatment gas to be dissolved in said liquid stream, said passage having an inlet port to receive said stream, and an outlet port;

a collider having an inlet port and an outlet port, said inlet port being connected to the outlet port of the injector, its outlet port being connected to a fluid release receiving said stream from said last mentioned outlet port for releasing the treated stream from the system while maintaining the system under pressure.

18. A system according to claim 17 in which said collider

comprises a body forming a chamber, pair of nozzles opposing one another, said stream being divided so a portion flows through each said nozzle with their streams flowing toward and meeting one another in said chamber, said body having an outlet port exiting the chamber.

19. A system according to claim 18 in which said portions of said stream intersect at an included angle not larger than 90 degrees.

20. A system according to claim 18 in which said portions of said stream are axially aligned, and in which said exit port exits the chamber laterally, midway between said nozzles.

21. A system for accelerating the solution of treatment gas into a liquid stream, said system being adapted to receive and maintain said stream under pressure, said system comprising:

an aspirating injector comprising a body having an axial passage, a converging section, a throat section and a diverging section in said passage in that order, an injector port through said body entering said throat section and adapted to receive treatment gas to be dissolved in said liquid stream, said passage having an inlet port to receive said stream, and an outlet port;

a reactor having an inlet port and an outlet port, the inlet port being connected to the outlet port of the injector, its outlet port connected to a fluid release receiving said stream from said last mentioned outlet port for releasing the treated stream from the system while maintaining the system under pressure.

22. A system according to claim 21 in which said fluid release comprises a gas/liquid separator which separates and releases the stream's liquid and the stream's gases which remain undissolved in said liquid.

23. A system according to claim 22 in which said fluid release further includes a regulator valve for the liquid stream.

24. Apparatus according to claim 21 in which said reactor comprises a body having a central axis with an internal cylindrical wall forming an axial internal cylinder, its said inlet port adapted to receive said stream, and its said outlet port adapted to discharge said stream with an increased dissolved amount of said treatment gas therein, said inlet port and said outlet port being centrally located on said central axis;

a nozzle in said inlet port directing said stream axially into said cylinder;

a partial barrier extending laterally across said cylinder dividing said cylinder onto a first chamber and a second chamber, said barrier having an upstream face facing into said first chamber and axially facing said nozzle, and a downstream face facing into said second chamber and facing said outlet port;

said upstream face having a concave circular first reflecting surface centered on said central axis and facing said nozzle, the radius of said reflecting surface being smaller than the internal radius of said internal cylindrical wall;

a plurality of axially extending arcuate blades, each having an outer wall closely fitting to said internal cylindrical wall, a dimension of radial thickness, and an inner wall concentric with its said outer wall, said blades having axially-extending side walls, said blades being angularly spaced from one another to provide an equal number of axial slots between them;

a cove surface circularly surrounding said first nozzle, extending to said inner walls of the blades and to their intersections with said slots, whereby said stream discharges from said nozzle so a major portion of it strikes said reflecting surface, which reverses a major portion of the flow to the cove surface which in turn reflects a major portion of said flow toward said barrier along said blades and in said slots, said partial barrier being pierced between with slots between said slots to provide for flow from said first chamber into said

second chamber, thereby to pass said flow from the first chamber into said second chamber, said outlet port discharging from said second chamber.

25. Apparatus according to claim 24 in which said second chamber comprises a partial barrier facing toward said outlet port, a plurality of blades and slots as in said first chamber, said slots in the first and second chamber being rotationally displaced from one another, whereby to form joggle shoulders encountered by portions of the stream flowing across the barriers, said second chamber including a cove receptive of some of the flow across the barrier to reflect at least some of the flow of the stream to the barrier in said second chamber, which in turn reflects it to said outlet port.

26. A collider receptive of two streams of a gas/liquid stream to accelerate the solution of the gas into the liquid, said collider comprising:

a body forming a chamber, pair of nozzles opposing one another, said stream being divided so a portion flows through each said nozzle with their streams flowing toward and meeting one another in said chamber, said body having an outlet port exiting the chamber.

27. A collider according to claim 26 in which said portions of said stream intersect at an included angle not larger than 90 degrees.

28. A collider according to claim 26 in which said portions of said stream are axially aligned, and in which said exit port exits the chamber laterally, midway between said nozzles.

29. A collider according to claim 26 in which each of said nozzles includes a converging section, and twisting vanes in said converging section whereby to impart a rotary motion to the outer region of the stream as it flows through the nozzle.

30. A reactor receptive of a stream of liquid and bubbles of treatment gas, for accelerating the solution of said gas in said liquid, said reactor comprising:

a body having a central axis with an internal cylindrical wall forming an axial internal cylinder, its said inlet port adapted to receive said stream, and its said outlet port adapted to discharge said stream with an increased dissolved amount of said treatment gas therein, said inlet port and said outlet port being centrally located on said central axis;

a nozzle in said inlet port directing said stream

axially into said cylinder;

a partial barrier extending laterally across said cylinder dividing said cylinder onto a first chamber and a second chamber, said barrier having an upstream face facing into said first chamber and axially facing said nozzle, and a downstream face facing into said second chamber and facing said outlet port;

said upstream face having a concave circular first reflecting surface centered on said central axis and facing said nozzle, the radius of said reflecting surface being smaller than the internal radius of said internal cylindrical wall;

a plurality of axially extending arcuate blades, each having an outer wall closely fitting to said internal cylindrical wall, a dimension of radial thickness, and an inner wall concentric with its said outer wall, said blades having axially-extending side walls, said blades being angularly spaced from one another to provide an equal number of axial slots between them;

a cove surface circularly surrounding said first nozzle, extending to said inner walls of the blades and to their intersections with said slots, whereby said stream discharges from said nozzle so a major portion of it strikes said reflecting surface, which reverses a major portion of the flow to the cove surface which in turn reflects a major portion of said flow toward said barrier along said blades and in said slots, said partial barrier being pierced between with slots between said

slots to provide for flow from said first chamber into said second chamber, thereby to pass said flow from the first chamber into said second chamber, said outlet port discharging from said second chamber.

31. A reactor according to claim 30 in which said second chamber comprises a partial barrier facing toward said outlet port, a plurality of blades and slots as in said first chamber, said slots in the first and second chamber being rotationally displaced from one another, whereby to form joggle shoulders encountered by portions of the stream flowing across the barriers, said second chamber including a cove receptive of some of the flow across the barrier to reflect at least some of the flow of the stream to the barrier in said second chamber, which in turn reflects it to said outlet port.

32. A reactor according to claim 31 in which said fluid release comprises a gas/liquid separator which separate and releases the stream's liquid and the stream's gases which remain undissolved in said liquid.